

unexpectedly higher activity as a liquid phase transalkylation catalyst than conventional TEA-mordenite (see Example 4 of the present application).

#### Rejection Under 35 USC 103(a)

Claims 1-9 have been finally rejected under 35 U.S.C. § 103(a) as being unpatentable over EP 0733608 (the '608 reference) in view of U.S. Patent No. 5,557,024 (Cheng et al). This rejection is respectfully traversed and reconsideration is requested.

① The '608 reference differs from the present invention in several important ways. First, the reference aromatics alkylation/transalkylation process is conducted in the vapor phase (see page 2, line 19 and the conditions disclosed on page 3, lines 20 and 44).

Second, the polyalkylated species is recycled to the alkylation reactor (see claim 1, lines 2 and 3), rather than transalkylated in a separate reactor as in the present invention. Although the Examiner at page 3, lines 10-12 of the July 20, 2000 Office Action states that "the transalkylation process can be operated in a separate reactor," the reference, clearly refers to "conventional vapor phase alkylation" (page 2, lines 19-21) as opposed to the specific *transalkylation* process which is the subject of the present invention. Thus, according to page 2, lines 29-31, the discovery of the '608 reference is that the transalkylation activity of the *alkylation catalyst* (emphasis added) is enhanced if the alkylation catalyst has a crystal size of less than 0.5 micron.

Third, the specific low crystal size catalyst of the '608 reference is quite different from the TEA-mordenite zeolite of the present invention. The former is rather sketchily described as an aluminosilicate with a Si/Al atomic ratio of 50 to 500 (see claim 1) and a primarily monoclinic structure (see page 3, lines 19-25). However, the '608 reference appears to teach away from the small pore TEA-mordenite (7 angstroms pore size) required by the present invention. The '608 reference teaches that "the pore size of the catalyst is also noteworthy, ranging from about 1000Å (1000 angstroms) to about 1800Å" (page 3, line 36). Such

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large pore size militates against substitution of the present invention's small pore size TEA-mordenite as catalyst (7 angstroms versus 1000-1800 angstroms!). The routineer in the art seeking a small crystal size catalyst for transalkylation reactions would thus actually be led away from the present invention's use of small pore size mordenite. Moreover, given that mordenite is orthorhombic, the '608 reference's "primarily monoclinic" (page 3, line 21) small crystal material, further teaches away from substituting small crystal TEA-mordenite to one skilled in the art.

Cheng is cited by the Examiner to overcome the '608 reference's admitted shortcomings in i) failing to disclose that the alkylation/transalkylation step is operated in the liquid phase, ii) failing to disclose MCM-56 alkylation catalyst and TEA-mordenite transalkylation catalyst, and iii) failing to disclose operating the transalkylation in a separate reactor. The Examiner characterizes Cheng as disclosing alkylation and transalkylation processes wherein MCM-56 or zeolite beta is used in an alkylation zone, while TEA mordenite transalkylates alkylation by-products such as polyalkylbenzene. The Examiner concludes it would have been obvious for one skilled in the art at the time the invention was made to have modified the '608 process by operating in the liquid phase because Cheng teaches operating alkylation and transalkylation in either vapor or liquid phase, and transalkylation in a separate reactor. The results of such modification would be expected to be similar or the same as the present invention, according to the Examiner.

ARGUMENT → { Despite Cheng's teaching of TEA-mordenite in transalkylation processes, it is respectfully submitted that one skilled in the art acquainted with the '608 reference's disclosure of using *small crystal size* aluminosilicate in transalkylation, would not combine the two references. First of all, the aluminosilicate of the '608 reference is described as having pore sizes 140 to 260 times greater than the TEA-mordenite of the present invention! One skilled in the art would be led away from the present invention inasmuch as it would not be reasonable to assume one could substitute TEA-mordenite for 1000-1800

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angstrom pore size material without radically affecting the products produced. Moreover, even if the TEA-mordenite were substituted in the '608 reference, the resulting process would be directed to a method wherein the transalkylation catalyst is employed in an *alkylation* reactor using recycled polyalkylaromatics, rather than the present invention's use of a separate transalkylation reactor.

Insofar as Cheng teaches the use of TEA-mordenite, it is as a separate transalkylation catalyst (combined with an MCM-56 alkylation catalyst) and as synthesized according to the disclosure of U.S. Patent Nos. 3,766,093 and 3,894,104. As shown by Examples 2 and 3 of the present application, TEA-mordenite produced according to these earlier patents has a crystal size of >5 micron! Also, Cheng is silent as to the phase conditions of the transalkylation step, particularly where the transalkylation is performed in a separate reactor from the alkylation step. | (2)

Accordingly, it is respectfully submitted that this combination of references fails to disclose or suggest in any way the present invention. In view of this, withdrawal of the rejection is respectfully requested.

U.S. Patent No. 4,891,458 to Innes et al. (Innes) is additionally cited in the rejection of Claim 10 which specifies operating conditions. In particular, Innes discloses transalkylation operated at 50-100 psig with benzene/polyalkylated benzene weight ratios of 1:1 to 50:1.

This rejection is respectfully traversed.

Despite Innes' teachings, it is respectfully urged that its combination with the '608 reference and Cheng fails to disclose or suggest the present invention, in view of the arguments made above respecting the latter two references.

Innes teaches a process for producing alkylaromatic compounds in which an aromatic compound is alkylated with a C<sub>2</sub>-C<sub>4</sub> olefin in the presence of zeolite beta in an alkylation zone under at least partial liquid phase conditions. After separation of the aromatic feed and the desired monoalkylated product, the polyalkylated fraction is contacted with additional aromatic compound in the presence of zeolite beta in a transalkylation zone under at least partial liquid

phase conditions. Even assuming, arguendo, that it would be obvious to combine and modify the processes of the '608 reference and Cheng so as to adopt the teaching of Innes, the present invention is neither disclosed nor suggested because Cheng suggests the use of a zeolite beta as a transalkylation catalyst. It is respectfully submitted that such a combination would therefore employ *zeolite beta* rather than *TEA-mordenite* in the transalkylation reactor. It would be directly contrary to the teaching of Innes to effect a combination in which small crystal TEA-mordenite is employed as the transalkylation catalyst. It is therefore respectfully submitted that the amended claims are patentably distinguished from Innes, the '608 patent and Cheng, alone and in combination. Accordingly, withdrawal of this rejection is respectfully requested.

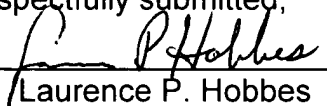
Applicants direct the Examiner's attention to the references cited in the Information Disclosure Statement filed herewith. WO 98/14417 (page 14, lines 12-25) discloses transalkylating benzene with diethylbenzenes over an acidic mordenite zeolite catalyst prepared in accordance with U.S. Patent No. 5,175,135 which teaches acidic mordenite zeolite catalyst having a crystallite size of 500 to 5000 angstroms (0.05 to 0.05 micron).

This art, while of some relevance, is not to be considered to teach or suggest the invention described and claimed in the aforementioned application. The references do not teach or suggest the use of small crystal TEA-mordenite in a separate transalkylation reactor.

CONCLUSION

In view of the foregoing remarks, it is respectfully submitted that the present claims relate to subject matter which is new, useful and unobvious and which otherwise meets the requirements for patentability. Accordingly, allowance of the present claims is earnestly solicited.

Respectfully submitted,

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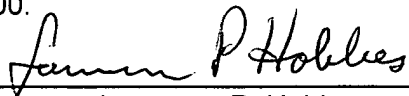
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